MOBILITY FOR COUNTERINSURGENCY WARFARE IN THAILAND

by

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A. INTRODUCTION

It is the intent of this paper, to establish an appreciation of the surface mobility requirements for counterinsurgency operations in the environment of Thailand expressed in the form of vehicle characteristics. These characteristics are derived primarily from the results of four years of field tests conducted as a part of the Mobility Program sponsored jointly by the Office of the Secretary of Defense Advanced Research Projects Agency and Thailand's Military Research and Development Center. Communist activities in Thailand and the role of the counterinsurgent forces are also included for consideration from the standpoint of operational requirements.

B. THE COMMUNIST INSURGENCY PATTERN IN THAILAND

The evolution of the Chinese-style Communist insurgency warfare pattern is almost always characterized by three levels of intensity--subversive activity, either latent or incipient; organized guerrilla warfare based on sufficient local or external support in conjunction with continued subversion; and finally, war of movement between more conventionally organized forces of the insurgents and those of the government, supported by continued subversion and guerrilla warfare. There has been no deviation from this pattern by the insurgent movement in Thailand. Following the post World War II period of political instability in Thailand, small anti-government groups initiated subversive operations in Northeast Thailand, to include the recruiting of Thai and Thai-born Chinese to form guerrilla bands. With the rise of Communist China and North Vietnam, increasing numbers of insurgents within these groups were sent to training centers in Peking and Hanoi for advanced training in insurgency and subsequently returned to lead the guerrillas against the Royal Thai Government. By the late 1950's, communist activities in Thailand spread to include several southern provinces bordering Malaysia. Distinct from the northeastern insurgents, the activities in the southern provinces were initiated by remnants of the communist forces which fled Malaya following their defeat in the Malayan emergency. By 1963, the insurgents, primarily in the Northeast, had increased their activities to occasional assassination of local officials, conducting armed propaganda meetings in small remote villages and otherwise spreading terror within their areas of operations to show that the government was unable to maintain law and order, and provide protection to its citizens.

Since 1963, the communist insurgents in Thailand have come under the increasing influence of the Peking regime. The extent of this influence was indicated in December 1965 when the Communist Chinese Foreign Minister Chen Yi stated that Thailand was to be the next target for a war of national liberation. Since then, communist activities have been stepped up. The insurgents have steadily gained local and external support in several provinces and have succeeded in establishing armed bands of small size. These bands appear to have been successful in obtaining their arms and ammunition through smuggling across the borders; however, their operations are typified by a definite lack of coordination and control due to topographical conditions, the lack of good roads, and the lack of communications equipment. These bands usually employ secluded mountain, swamp, or jungle

retreats as bases of operations. Such bases are extremely difficult to find by the government forces because of the difficult terrain and heavy foliage, thus providing the insurgents with valuable areas for rest, recuperation and training.

The affected regions are the provinces of Sakol Nakorn, Nakorn Panom, Ubon, Nong Khae, Udol, Buriram, Kalasin, Loey and Chaiyabhum in the Northeast; and the provinces of Yala, Trang, Narathiwat, Phattalung and Prachaub Khirikhan in the South.

C. THE COMBAT ROLE OF COUNTERINSURGENT FORCES

The Royal Thai Army (RTA), the Border Patrol Police (BPP), and the Provincial Police (PP) comprise the basic counterinsurgency forces within Thailand. Essentially, the role of these forces is to isolate and defeat insurgent forces, and to cut-off their external aid and supply lines. In combating the insurgent guerrilla forces, the basic tactical alternatives are offensive strike operations including search, encirclement, and pursuit activities. Interdiction operations may involve one or more of the following:

a. direct assault of the insurgent base areas,

b. continuous patrolling of affected borders,

c. development and use of small, self-sustaining military Special Forces type teams to conduct guerrilla warfare along the supply routes,

d. employment of naval vessels and patrol craft to conduct sea and river operations, particularly at unauthorized ports and logical discharge points for contraband.

To carry out these roles successfully, the counterinsurgent forces must be capable of beating the insurgent at his own game; i.e., employing hard-hitting highly mobile forces and using tactics which are as "flexible" as those of the insurgent guerrilla. The insurgent's strongest allies are the dense vegetation areas, the marshes, the jungle, and the steep mountainous terrain in which he operates. Such terrain favors the insurgent since it provides excellent concealment, restricts observation and fire, complicates and reduces communications, and perhaps above all, decreases the conventional ground mobility of government forces. To counter this situation, the government forces must possess mobility characteristics which exceed those of the insurgent in his own habitat in order to exploit their superior weaponry. The Mobility Program in Thailand is dedicated to the task of identifying these characteristics.

D. SURFACE MOBILITY PROGRAM IN THAILAND

The Mobility Program in Thailand is one of several major research and development programs being conducted within the Military Research and Development Center (MRDC), a combined U.S.-Thai military organization in Bangkok, Thailand. The Thai component of MRDC is under the direction of the Directorate

of Education and Research of the Supreme Command Headquarters. The U.S. component is a Field Unit of the U.S. Office of the Secretary of Defense, Advanced Research Projects Agency (OSD/ARPA). The overall effort of the U.S. component of MRDC is conducted as a part of ARPA's program on Remote Area Conflict, known as Project AGILE. This program is directed toward the identification, definition, and technical description of needs in selected remote environments and supported by a significant U.S.-based research and development program to provide the basis for meeting these needs. The surface mobility aspects of the Mobility Program in Thailand are assigned to the Mobility Division of MRDC. The overall objective of the Mobility Division is to improve the surface mobility capabilities of Thai forces engaged in, or threatened with, conflict in remote areas. Included are land vehicles and watercraft designed to transport tactical units and to deliver supplies and equipment in support of counterinsurgency operations.

Approach

Since late 1962 when the Mobility Program in Thailand was first initiated, the bulk of the effort has been concentrated on ground mobility, with emphasis on vehicle research and testing. The purpose of such testing is not to evaluate vehicles for military application; it is rather to determine the validity of design concepts and principles by which improved vehicles can be developed for use in remote areas. Vehicles which are brought to Thailand for test may be in the experimental category incorporating radically different design principles. They may also be standard vehicles possessing particular features worthy of analysis under controlled local test conditions. On occasion, vehicles which were considered operationally unsuitable have been tested in order to investigate some feature of particular interest in their design.

Conclusions Drawn From Test Results

The Mobility Division has tested twenty-three vehicles to date in various environments within Thailand. The vehicles which have been tested ar the M-37, XM-561 with standard and terra tires, Jiger, Hovertruck, Centipede, Tote Gote, Dodge Power Wagon, Trackmaster, Spryte, Rolligon, M-116, XM-571, Hovercraft, Gama Goat, Thai Logistical Trailer, FV432, FV437, Stalwart, M-113 1/2, M-551 and the Velo Solex, BSA, and Trailbreaker motorbikes. These vehicles are displayed in photos 1 to 24. In the course of conducting these tests, considerable knowledge and experience has been gained with regard to the terrain factors affecting surface mobility in Thailand. Before turning our attention to a discussion of the mobility requirements for counterinsurgency warfare, it would be useful to review some of the pertinent conclusions drawn from the test results relative to these terrain factors.

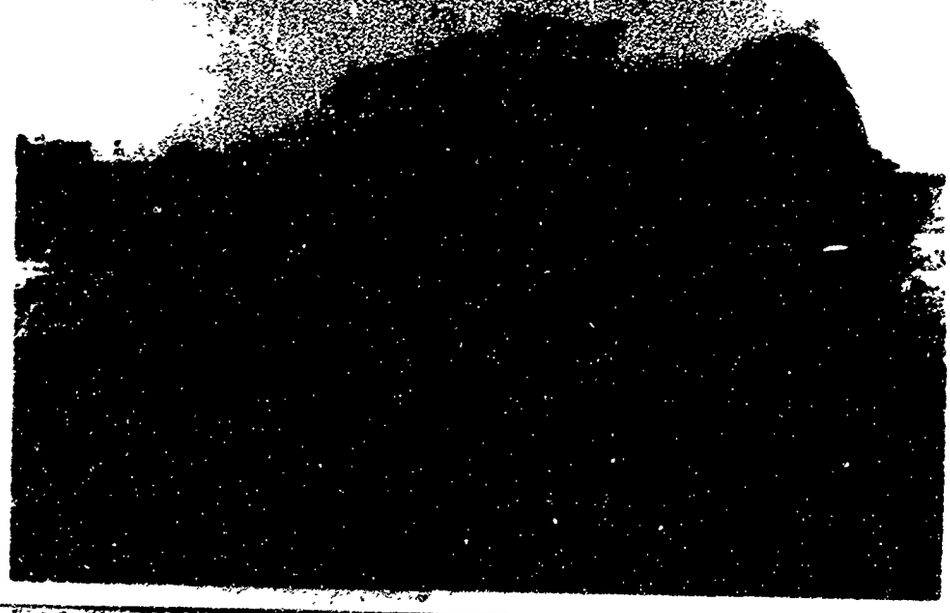
Rice Fields

Rice fields are passable with light vehicles; however, speeds must be reduced to a range of 1.5 to 3.5 mph because of the innumerable dikes

1. M-37, 3/4 Ton Truck, manufactured by Chrysler Motors Corporation

2. XM-561, 1-1/4 Ton Cargo Vehicle, 6x6 with Standard Tires, Manufactured by LTV Aerospace Corporation

4. JGR. Load capacity 400 pounds. Manufactured by JGR Gunsports Ltd., Canada

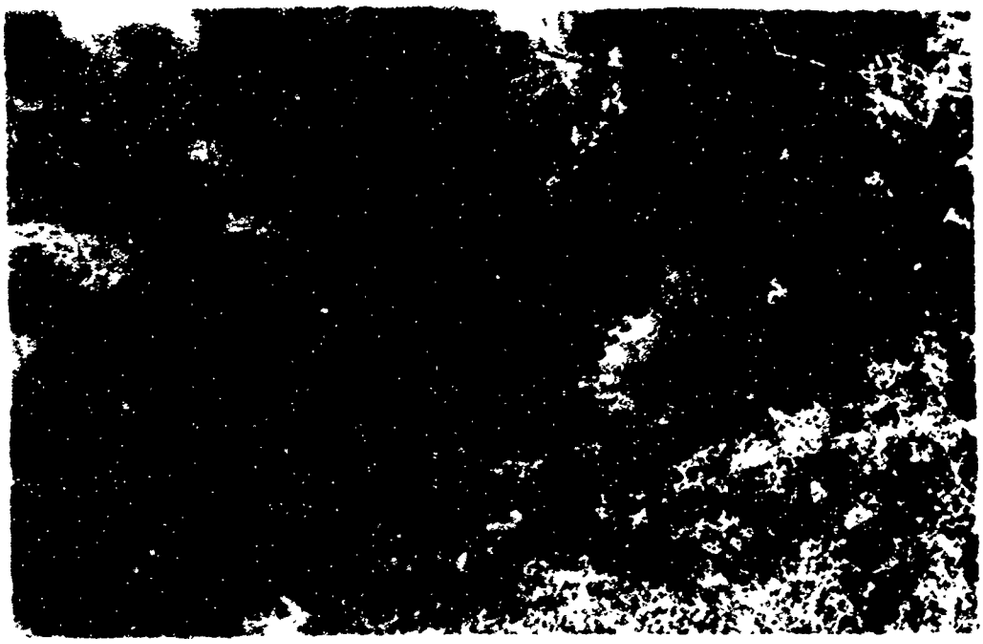


[illegible] capacity 1-1/4 tons.
[illegible] Armstrong Ltd., UK.

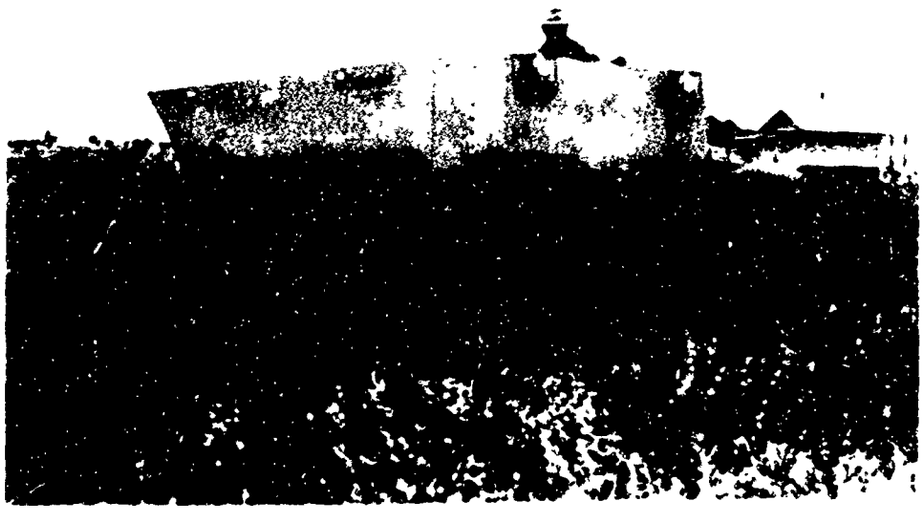
6. CENTIPEDE. Manufactured by Jered Industries, Inc.

7. TOTE GOTE. Load capacity 500 pounds.
Manufactured by Bonham Corporation.

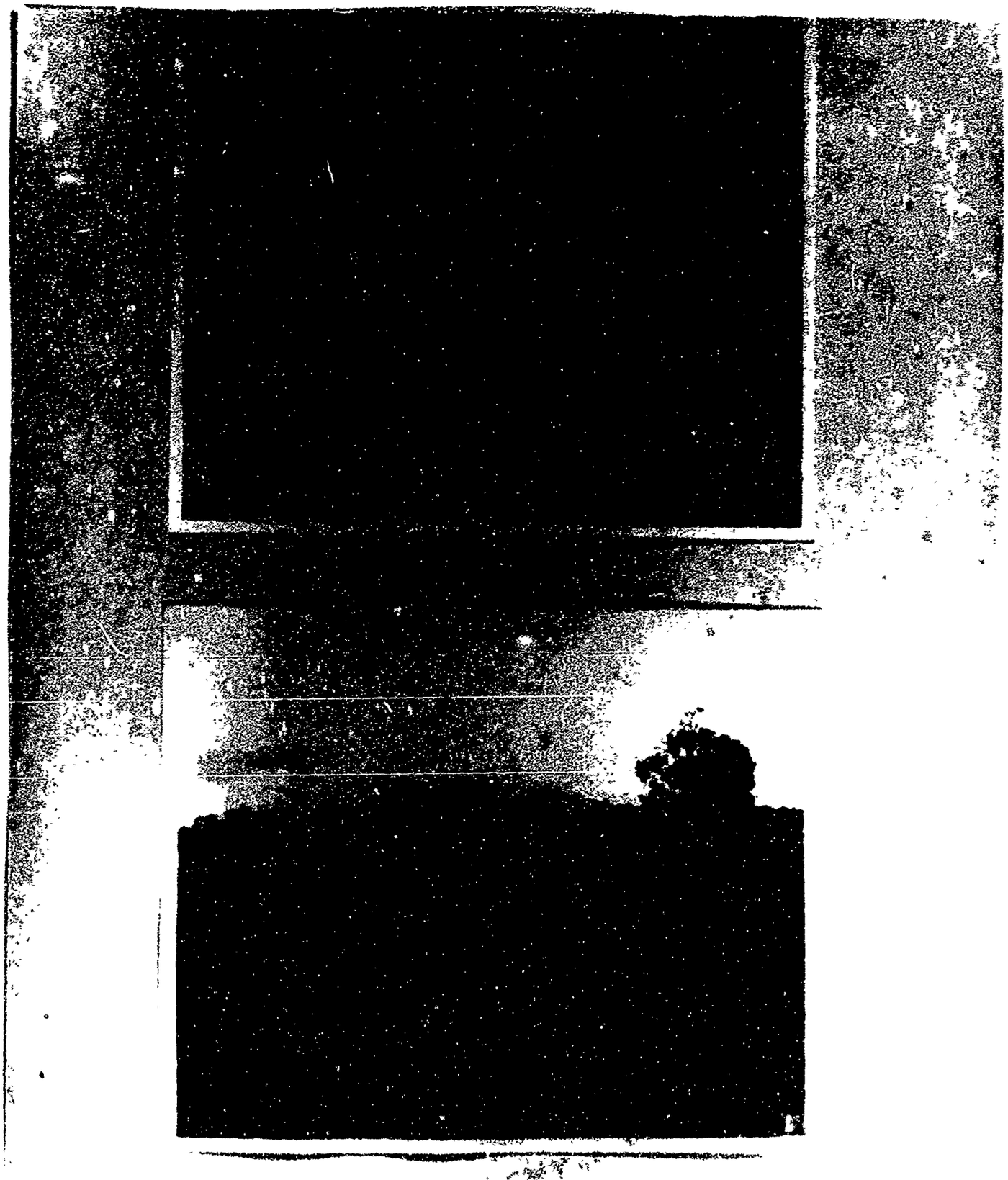
8. DODGE POWER WAGON, 1-1/2 Ton Truck.
Manufactured by Chrysler Motors Corp.



9. TRACKMASTER. Load capacity 1800 pounds. Manufactured by Thiokol Chemical Corp.



10. SPRYTE. Load capacity [illegible]. Manufactured by Thiokol Chemical Corp.



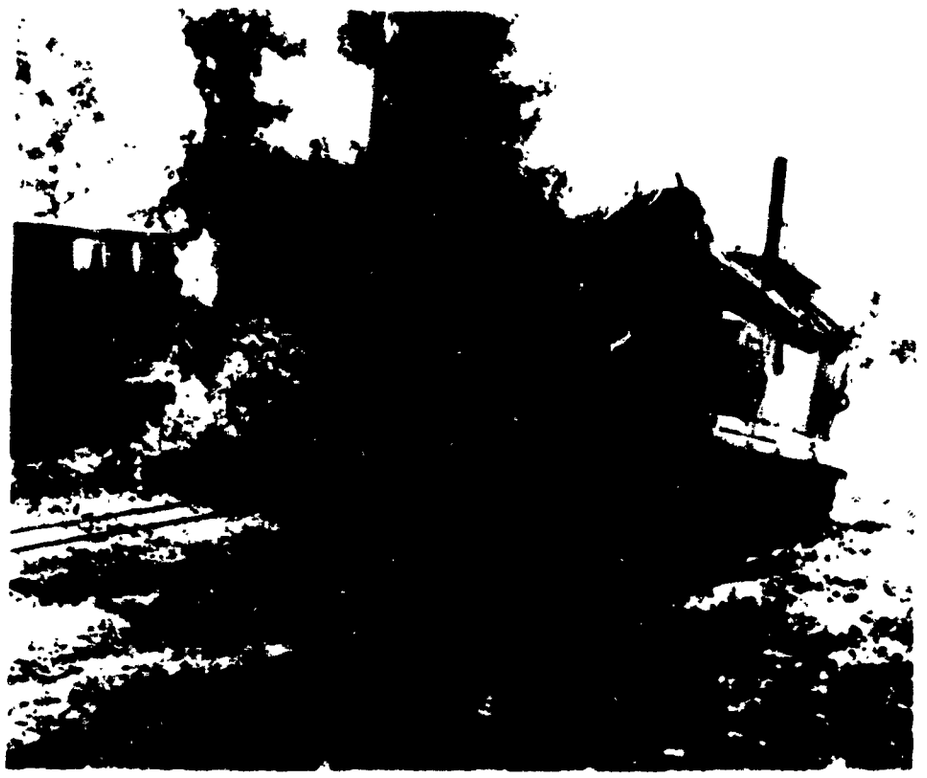
12. M-116, 1-1/2 Ton Truckbed and Cargo Carrier.
Manufactured by Pacific Car and Foundry Company.

13. XM-571, 1 Ton Tracked Articulated Utility Carrier. Manufactured by Canadair Ltd.

15. GAMA GOAT. 1 Ton Cargo Truck, 6x6.
Manufactured by LTV Aerospace Corp.

16. [illegible] LOGISTIC TRAILER. [illegible]
[illegible]

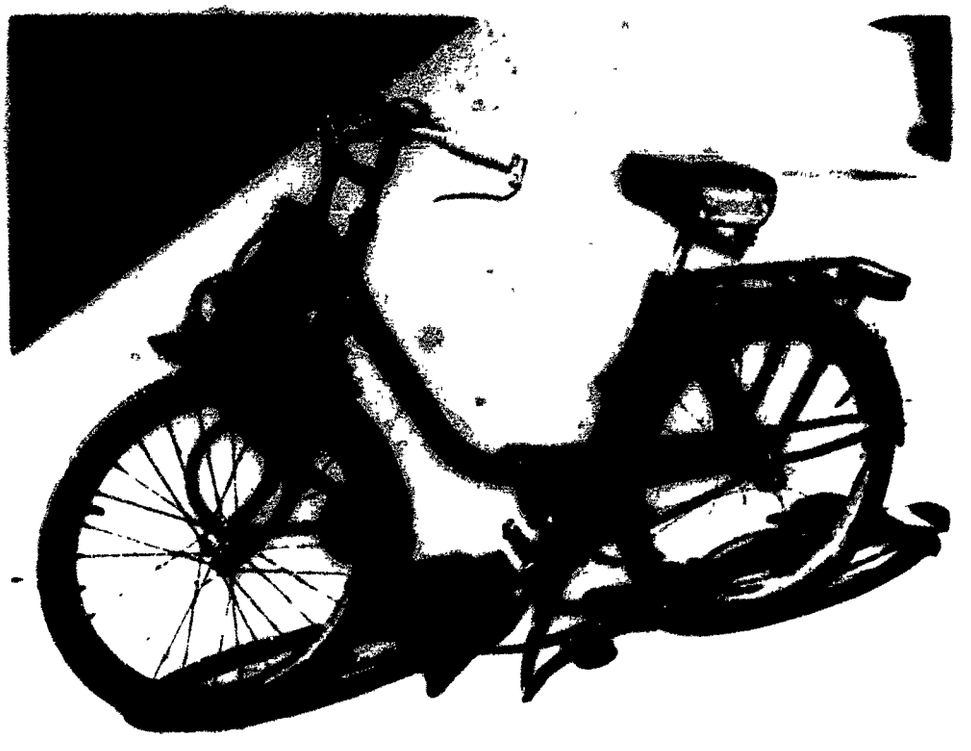
17. FV-432 Mk 2, Full Tracked Personnel Carrier. Developed under sponsorship of the Fighting Vehicles Research and Development Establishment, UK.



18. FV-437 "Pathfinder", an Experimental Vehicle developed under sponsorship of the Fighting Vehicles Research and Development Establishment, UK.

19. STALWART. 5 Ton Load Carrier, 6x6.
Manufactured by Alvis, Ltd., UK.

21. M-551 Armored Reconnaissance/Airborne Assault Vehicle . Manufactured by Allison Division, General Motors Corporation.



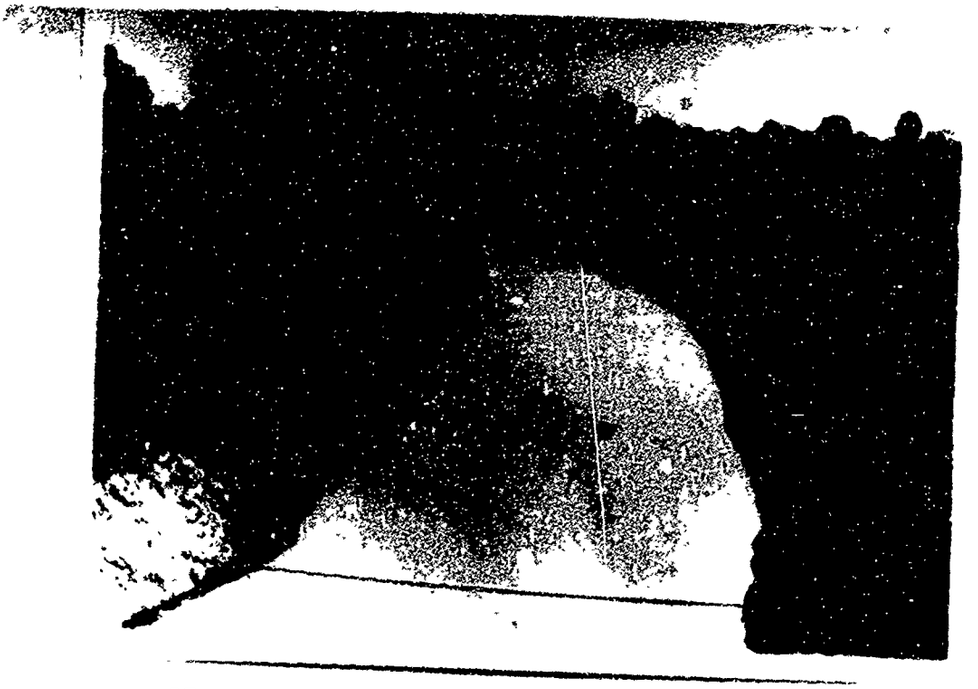
... LEX Motorlike. Manufactured by t.e Velo Solex Co., France.

23. BSA Motorbike.
Manufactured by BSA
Motorcycles, Ltd. UK.

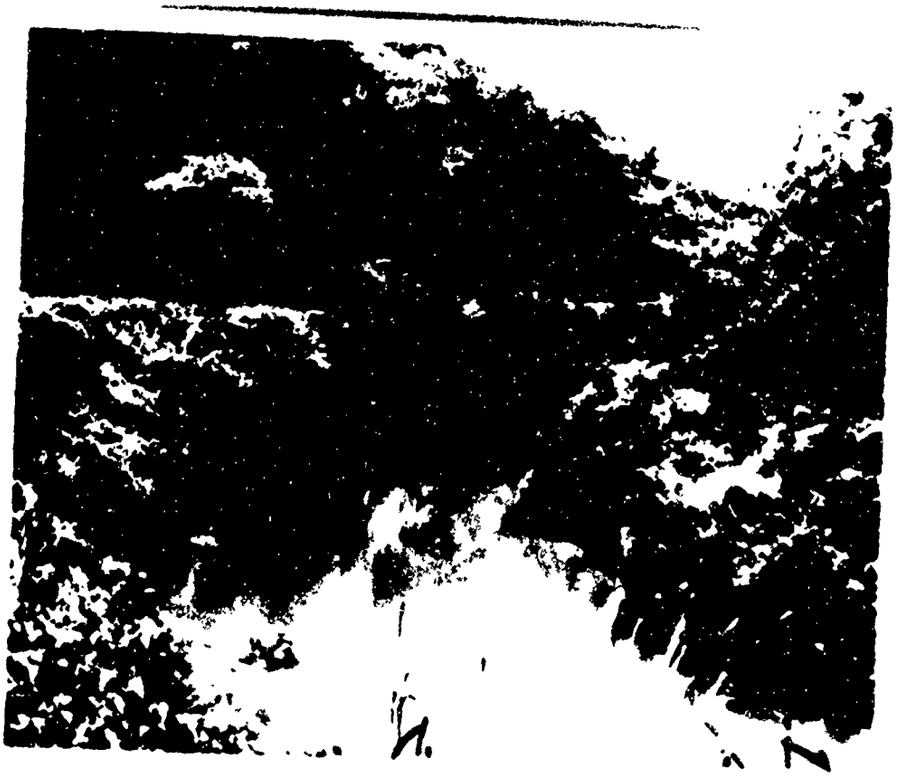
24. TRAILBREAKER
Manufactured by Kokon, Inc.

25. Flooded Rice Paddy with growing rice near Lopburi after field tests.

26. XM-561 with Standard Tires immobilized in irrigation ditch near Lopburi.



27. Typical secondary irrigation ditch in the central plain.



encountered. Dikes which are too high to be traversed are found in some places, but in most instances only short detours are required to by-pass them. In flooded paddies, the soil conditions in some cases will yield cone index readings of 40 and below, immobilizing most vehicles except those with extremely low ground pressure.

It has been generally concluded from field tests in rice paddies that vehicles having 5.7 psi ground pressure or less have no difficulties in this environment. However, wheeled vehicles do have difficulty crossing irrigation ditches, regardless of their ground pressure. Wheeled vehicles should have a ground clearance of at least 18 inches and tracked vehicles 12 inches to negotiate paddy bunds effectively. The 18 inch figure for wheeled vehicles can be reduced to 15 inches if the vehicle is articulated. These dimensions for ground clearance were concluded from field tests in conjunction with a Rice Field Study conducted by the MRDC Mobility Division which revealed that 95 percent of all rice field dikes in Thailand are 21 inches or less in height. Extensive rice paddy tests, trafficability and drawbar pull tests, and, to some extent, trail tests reveal that terra tires will usually double the mobility of wheeled vehicles in soft soils.

Hydrologic Components

Many of the canal and river channels, particularly in the Northeast, are impassable or nearly so because of the very steep banks. Very long detours are generally required to find suitable entrance and exit sites, and these are rarely opposite each other. Many of the channels are well beyond the fording depth of most vehicles. Movement across major channels is very difficult and hazardous, particularly during flood conditions.

Numerous measurements of stream velocities taken throughout Thailand during a recent remote area waterways study conducted by the Mobility Division revealed that the majority of the major rivers and their primary tributaries attain maximum velocities of approximately 6.5 mph in the rainy season. While the figure of 6.5 mph would be the ideal value to strive for from a design point of view, vehicle tests in Thailand have revealed that vehicles with water speeds of at least 5 mph would be acceptable for effecting river crossings under most conditions in all seasons. Regarding the negotiation of steep banks which are often quite soft, the tracked vehicles have the edge over wheeled vehicles because of their better traction capability, all other factors being equal.

Trails

Trails are fairly easy to negotiate in the dry season with speeds of 4 to 12 mph, the reduction in speed being caused by deep ruts and overhanging vegetation. In the wet season, movement becomes extremely difficult or impossible because of vegetation adjacent to the trail, ruts up to 21 inches in depth, soft soils with cone index readings ranging between 20 and 80, deep cuts up to 48 inches in depth, numerous stream and river crossings with steep banks, and bridges which must often be by-passed because of low

29. Vegetation limits visibility and conceals obstacles on trails.

31. Puts and soft soils result on trails during rainy season.

32. STALWART after falling through d. log bridge on the Chiengmai Trail.

load limits or lack of repair. Vegetation and undergrowth become very dense, reducing the normal visibility range of 30 to 120 feet down to 5 to 10 feet.

Experience derived from trail tests indicates that in addition to stream and river crossings, the vegetation, soft soils, and bridges encountered are the major trail obstacles. Vegetation adjacent to trails becomes very dense in the rainy season, often narrowing the trail considerably and concealing obstacles such as trees and tree stumps which can seriously damage vehicles. Since traffic on trails is usually restricted to ox-carts, the trail width is often a function of the width of the ox-cart, which varies between 7 and 8 feet. Therefore, for best performance on trails, the vehicle should be no wider than 7 feet. In the case of bridges, the problem is multiple. There is the danger of the vehicle falling through the bridge coupled with the inherent problems associated with recovery. There is presently considerable indecision as to what constitutes the allowable load limits of bridges on trails. Prior to the MUDLARK tests this past year, it was thought that the bridges would take up to 8 tons; however, in MUDLARK even bridges in the worst shape withstood a 9 ton vehicle and many other bridges withstood 16 ton vehicles. At any rate, in deciding whether or not a bridge will be used, the condition of the bridge is a critical factor. Gauging the condition of these log bridges is a very difficult problem. The alternative of not using the bridge is to by-pass which almost always subjects the vehicle to the very severe ground configurations that characterize bridge by-passes on trails. The assortment of vertical obstacles combined with soft soils which are encountered in by-passes often constitute a true test of mobility. In such environments, the vehicle's slope climbing capability as well as its angle of approach and angle of departure can be critical factors. Results of field tests indicate that both wheeled and tracked vehicles must be capable of operating on longitudinal slopes of at least 60 percent and side slopes of at least 40 percent. The angle of approach required for both wheeled and tracked vehicles is 90 degrees while the minimum angle of departure found necessary is 68 degrees for wheeled vehicles and 31 degrees for tracked vehicles.

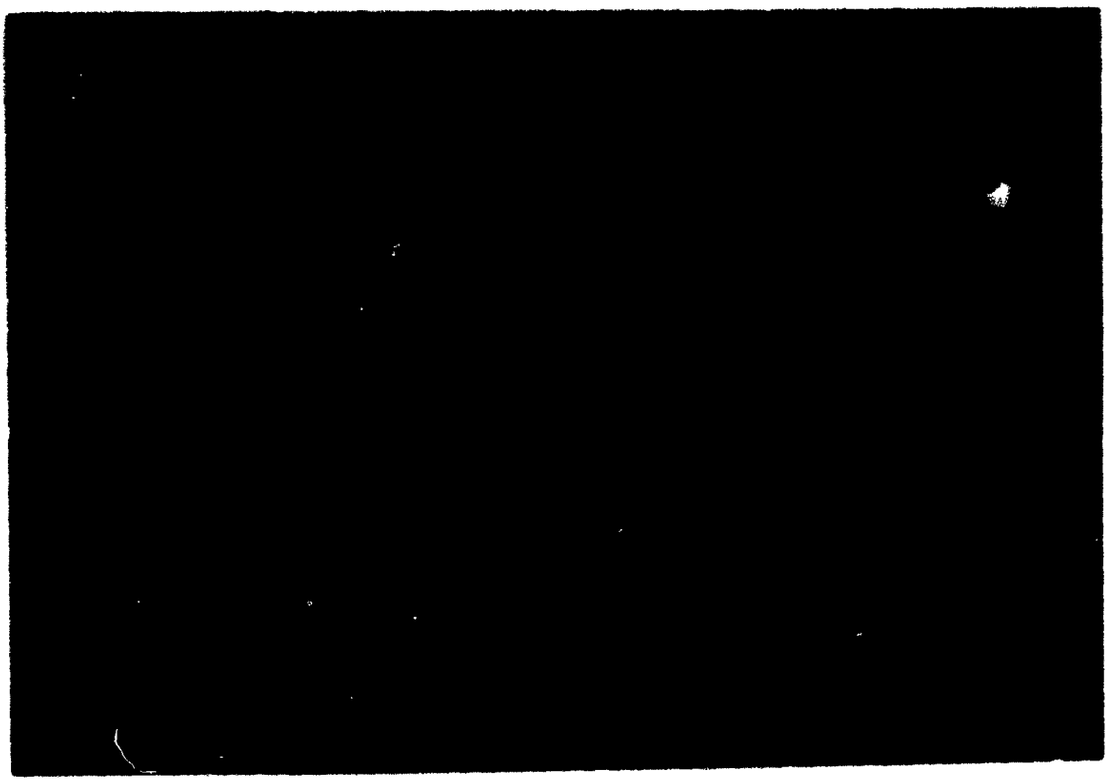
Cross-Country

In the lowlands (terrain below the general level), the visibility is very difficult in the dense forested areas. Speed is reduced to 1.5 to 3 mph because of the danger of encountering concealed obstacles such as tree stumps and fallen trees. Vertical obstacles such as borrow pits and eroded areas also slow movement. In some places, the vegetation is dense enough to prevent the movement of light vehicles.

In the uplands (terrain above general level), the movement is often relatively easy but slow because of minor obstacles such as laterite pits and rill marks which can easily be avoided with relatively short detours. In most cases, vegetation is not a severe obstacle since large trees and

33. XM-561 engaged in cross-country vegetation tests 70 kilometers north of Chumpon.

35. Grass which grows as high as five to six feet often hiding obstacles underneath. A dry evergreen forest is in the background. Photo taken at Kaho Yai National Park, 30 kms south of Pak Chong.



37. Tropical rain forest in the Huey Hod District of Trang Province in Peninsular Thailand. Dense vegetation seriously impairs visibility.

stumps are widely spaced. However, in some places, drivers cannot see the ground because of dense low growing vegetation; hence, movement is slowed in these areas to a range of 1.5 - 3.5 mph to preclude damage and/or immobilization resulting from concealed obstacles. Many bamboo thickets and the very dense forest regions are virtually impassable to most vehicles, as are the steep ravines which are frequently encountered.

Tests conducted in vegetation encountered in cross-country travel reveal that brush guards are essential on vehicles to protect personnel and to prevent damage to windshield and cab assemblies.

Roadways

The road network in Thailand is like the configuration of a tree; the trunk representing major roadways between major cities or communications centers, and the branches of the tree representing the secondary roads. The bulk of secondary roads have either laterite, crushed gravel or dirt surfaces which often get deeply rutted and soft in places during the wet season. Allowable speeds during these periods are reduced to a range of 3.5 to 12 mph from a normal speed range of 10 to 45 mph. Embankments and the borrow pits adjacent to the roads are often extremely difficult to negotiate, usually requiring long detours to reach suitable crossing points.

Field tests indicate that conventional wheeled vehicles have an advantage on bituminous roads which becomes very greatly reduced as the road surface deteriorates. On gravel, dirt and laterite surfaces, the tracked vehicles are only slightly inferior to the wheeled vehicles. When road embankments and borrow pits must be crossed, the best chance rests with the tracked vehicle, particularly the articulated tracked vehicle which can approach difficult places and cautiously back out if necessary. The conventional tracked vehicle, on the other hand, once committed must plunge ahead and risk the consequences.

F. MOBILITY REQUIREMENTS FOR COUNTERINSURGENCY WARFARE IN THAILAND

In the preceding discussions, only the terrain factors were considered. In general terms, let us now review the role of the counterinsurgent forces and the level of insurgency in Thailand for consideration from the standpoint of operational requirements. As described earlier, the insurgency movement in a number of the affected provinces is approaching the guerrilla warfare level. In those provinces where the insurgency is at a lower level, the task of combating the insurgents' subversive activities rests primarily with the police agencies and civic action teams. Where the insurgency is approaching the level of guerrilla warfare, the task involves additionally military-type small unit tactical operations.

In police operations, there appears to be an urgent need for a vehicle to enable two to four man police teams to visit remote villages frequently and in all seasons for the purpose of reassuring the villagers of government

protection. This need also extends to the civic action teams which make frequent year-round visits to villages to prevent and/or eliminate the cause of communist subversion. In conducting such visits, the full spectrum of environmental conditions are often encountered causing most of the visits to be conducted on foot at the present time, especially during the rainy season. The vehicle to be used in these operations must possess characteristics to overcome these conditions. It must be capable of negotiating most soft soil conditions likely to be encountered and have a self-recovery capability in the event that immobilization occurs. It must be amphibious to swim the many canals and rivers encountered while travelling cross-country and on trails. It must be capable of negotiating the narrowest ox-cart trails and foot paths often as little as five feet wide which occasionally are the only means available to reach some of the remote villages. The vehicle should be capable of cross-country speeds up to 20 mph and road speeds of at least 35 mph to provide the police with an effective capability to respond to emergency calls from villages. Operations in remote areas for prolonged periods dictate that the vehicle require little or no maintenance and only casual servicing.

In the conduct of small unit tactical operations, there is a need for a vehicle to move personnel, equipment, and supplies over all types of terrain in Thailand, by day and night and in all seasons. The vehicle should be capable of providing "greater than foot" mobility to a squad-sized force complete with field gear. Such a vehicle would be used to position troops to block insurgent escape routes, to quickly regroup scattered forces preparatory to launching subsequent operations, and to serve as an ambulance to evacuate the wounded. The vehicle should be capable of serving as a weapons platform, through the application of weapons kits, to provide the infantryman with close-in fire support. The vehicle should also have the inherent capability of serving as a logistic support vehicle. It should be capable of cross-country speeds up to 20 mph and road speeds of at least 40 mph. The vehicle should be capable of long periods of operation in the field with a high degree of reliability, requiring only occasional maintenance and servicing. To facilitate its use in the field, the vehicle should be amphibious, air-droppable and air-transportable in a helicopter similar to the CH-47.

Vehicle Characteristics

From the foregoing discussions, it appears that we can postulate two sets of hypothetical vehicle characteristics that would be useful in counterinsurgency operations in Thailand--a rugged multi-purpose military vehicle for use in small unit operations; and a less rugged, smaller, less expensive vehicle for police and civic action team operations. The following is a summarization of the vehicle characteristics:

	Police Vehicle	Military Vehicle
1. Ground pressure	5.7 psi or less	5.7 psi or less
2. Gross weight	2,000 lbs	Not to exceed capability of CH-47 helicopter
3. Load capability	750 lbs	At least 2,000 lbs
4. Speed:		
a. Water	At least 5 mph	At least 5 mph
b. Cross-country	Up to 20 mph	Up to 20 mph
c. Road	Up to 35 mph	At least 40 mph
5. Ground clearance:		
a. Wheeled vehicles	18 inches (15 inches for articulated vehicles)	18 inches
b. Tracked vehicles	12 inches	12 inches
6. Width	60 inches maximum	84 inches maximum
7. Angle of approach	90 degrees	90 degrees
8. Angle of departure:		
a. Wheeled vehicles	68 degrees	68 degrees
b. Tracked vehicles	31 degrees	31 degrees
9. Longitudinal slope capability	60 percent	60 percent
10. Side slope capability	40 percent	40 percent
11. Self-recovery capability	Yes	Yes
12. Air drop capability	No	Yes
13. Air transport capability	Yes	Yes

In conclusion, it is emphasized that the mobility characteristics enumerated in this paper were derived from the results of field tests rather than through the use of theoretical formulas. Moreover, it is intended that these characteristics be used only as a guide. As new vehicle concepts are studied and more information becomes available relative to the influence of the local environment on vehicle mobility, these characteristics will be up-dated and refined to assist vehicle designers in the development of better vehicles for use in remote areas.

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